technology ■ opportunity

National Aeronautics and Space Administration
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computer software

Improve the Image Quality of JPEG Images and MPEG Video Sequences

...using algorithms based on local-frequency image-adaptive postfiltering

The low-resolution JPEG image (left) is enhanced (right) using the ESAP algorithm method.

NASA Goddard Space Flight Center invites companies to license a new technology proven to enhance the image quality of compressed grayscale or color JPEG images and MPEG video clips commonly used on Web sites, online applications, and streaming media. The Estimated Spectrum Adaptive Postfilter (ESAP) algorithm helps to improve the objective and subjective quality of these images as well as enhance their perceptual visual quality as compared to baseline JPEG images.

Benefits

- **Innovative**: Minimizes the loss in image quality that occurs in compressed JPEG images
- **Accurate**: Yields minimal blurring of an image's true edges while significantly reducing the blocking artifacts resulting from high image compression
- **JPEG-compliant**: Adheres to the coded stream syntax of the Independent JPEG Group (IJG) Software
- **Cost-effective**: Can be implemented in firmware or a fast processor, eliminating the need for additional overhead expenses

Applications

- Internet
  - – Web-ready images
  - – Streaming video
- Moderate-rate (4-8 Mbps) HDTV broadcasts

Technology Details

What it is

Goddard's ESAP algorithm is an image-adaptive postfiltering method designed to minimize the discrete cosine transform (DCT) blocking distortion caused by compressing JPEG images. The ESAP algorithm method improves both the measurable and subjective quality of the images.

The ESAP algorithm consists of an ESAP encoder, which includes a JPEG encoder and a JPEG decoder. The JPEG decoder uses the DCT coefficients to estimate the two-dimensional bandwidth of each pixel in the image. The local pixel bandwidths are then used to adaptively postfilter the decoded image. The postfiltered image shows minimal blurring of its true edges, while blocking distortion is significantly reduced.

Why it is better

Default video and image encoding algorithms for JPEG, MPEG, and HDTV files produce many quality-reducing blocking effects when operating at low bit rates. Previous techniques to overcome this problem were mostly nonlinear filtering methods based on limiting, local pixel statistics rather than on more accurate local frequency content. These techniques offer lower peak signal-to-noise ratio (PSNR) and lower subjective quality than the techniques based on Goddard's algorithms. In addition, ESAP can be cost-effectively implemented in firmware to enable real-time image results. The algorithm can be commercially developed to enable enhanced video and image quality that is superior to previous techniques and the default JPEG or MPEG compression parameters.

Patents

NASA Goddard has patented this technology (U.S. Patent No. 6,760,487).

Licensing and Partnering Opportunities

This technology is part of NASA's Innovative Partnerships Program, which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to consider licensing the Estimated Spectrum Adaptive Postfilter and the Iterative Prepost Filtering Algorithms (GSC-14213-1) technologies for commercial applications. online: **http://techtransfer.gsfc.nasa.gov**

For More Information

If you are interested in more information or want to pursue transfer of this technology (GSC-14213-1), please contact:

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More information about working with NASA Goddard's Office of Technology Transfer is available online:
http://techtransfer.gsfc.nasa.gov